DEPOT AND METHOD FOR OPERATING A DEPOT

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] This application claims a priority of the Swiss patent application No. 1999 0761/99, filed on April 23, 1999.

FIELD OF INVENTION

[0002] The present invention relates to a depot and a method of operating a depot.

BACKGROUND OF THE INVENTION

[0003] A depot serves to store of articles for a determined or undetermined time and to make articles available on request, for example, for delivery on a set date or for immediate delivery. It is, hereby, of importance articles stored depot occupy as small amount of storage space as possible so that articles can be stored and retrieved as fast as possible. In addition to space requirements, much needed ground area is of a particular importance.

[0004] Demands for article storage have led to prior art depots to be designed, almost exclusively, in shelf like building structures, for example, with a plurality of floors having a plurality of storage areas. For example, DE 3902080 A1 discloses a parking house which is of a shelf like design and includes parking boxes with parking spaces for motor vehicles above each other as well as adjacent each other and behind each other. The vehicles are parked in a loading bay on palettes and

stored through a shelf stacking device in the parking boxes. The delivery of the vehicles proceeds in the opposite sequence.

[0005] U.S. Patent Number 5,304,026 discloses an automatic parking "device" having several floors and a shelf-like structure for parking vehicles. Each floor is divided into at least one row of equal blocks, with each row of equal blocks formed with a centrally located elevator passage way and at least two parking units on opposite sides of the elevator passage way. The parking boxes having parking spaces for motor vehicles are parked above each other, as well as aside of each other and behind of each other. The vehicles are parked in loading stations on palettes and stored by elevators in the parking boxes. The delivery of the vehicles proceeds in an opposite sequence.

[0006] U.S. Patent Number 3,802,579 discloses a parking house comprising a plurality of units of parking boxes arranged adjacently, each having open ends, with the units being arranged adjacent and behind each other. Vehicles are stored vehicle cells arranged in a single vertical column in a storage unit. The vertical storage units are arranged in one or more rows between fixed entrance and exit stations. A vehicle is driven over the top of the first vertical storage unit or into a vacant cell in the unit. The particular storage unit in which the vehicle is parked must always be moved vertically for an open path to the entrance and exit stations

[0007] EP 0653532 discloses a shelf-like parking house with two shelf serving apparatuses capable of travel in a common lane. For storing of a vehicle, this vehicle is parked in an input station on a pallet. The pallet, including the vehicle, is thereafter seized by one of the shelf serving apparatuses by means of horizontally extendable receiving means, and, thereafter, stored in one of the storing places located adjacent or above each other. The delivering and making ready proceeds at a delivery station in the same but opposite sense. In order to obtain a desired

orientation of delivery, the palettes loaded with vehicles can be rotated in the delivery station by stationary rotating means.

[0008] Whereas the need of a as high as possible density of the stored articles is sufficiently met by the presently known structural designs of automatic depots the processing time for the storing and delivering, respectively, of articles by these depots is not satisfactory.

SUMMARY OF THE INVENTION

[0009] The present invention provides a depot with an automatic storing system for articles with at least one input and one delivery station. The input station(s) comprise at least two cells and each of the cells is usable alternatively once as loading cell for the receipt of a new article and the other time as transfer station onto the storing system of an article received before. The depot is designed such that each cell, while used for receiving an article is positioned in a first position, and while used for transferring is positioned in a position different from said first position. The first position is identical for all cells of the input station, and while an article is received by one of the cells of the input station, an article previously received by another cell can be transferred onto the storing system.

[0010] The cells of the input station form preferably a unit which is positionable in at least two positions, wherewith the possibility of a timely alternating, common use of certain positions for the receiving and delivering of articles, respectively, is arrived at. By means of this, a minimum of space is needed for the input station.

[0011] When the cells are displaced in a vertical direction, either the receiving of an article and the transferring of the article onto the depot system may be carried out at positions located above each other which reduces the floor area to a minimum as needed for the input station.

[0012] The input station preferably includes two cells, of which each is displaceable between two positions. The cells are intermittently operable. One cell receives an article while, alternatively, the other cell transfers a different article to the depot system, and vice-versa. Thus, the system operates without any non-productive idling times of individual cells as utilization of space at the input station is optimized.

[0013] Preferably, at least one of the cells includes means for rotating the articles. Thus, it is possible to provide a desired orientation for transferring of the article to the depot system, thereby providing a time saving during a later delivery.

[0014] In a preferred embodiment of the present invention, the depot is operated as a parking house. Regardless of the direction the vehicle drives into the input station, any desired delivery orientation can be reached by rotation. This reduces the space requirement of the delivery station, and space, for example, for maneuvering, is preferably provided. Driving out from the delivery station is easily facilitated, allowing a saving of time when delivering the vehicles.

[0015] In an alternative embodiment, the input station is operated as a delivery station and the delivery station as desired as input station, respectively. In this case, the stations are also called loading stations.

[0016] In addition to at least one apparatus for serving shelves, a stationary transfer means is provided for displacing articles in the depot system, for storing articles on storage areas of the depot and/or for delivering articles from the storage areas of the depot system. Moreover, additional stationary lifting means is provided for vertically displacing vehicles in the depot system. Such lifting means are placed advantageously close to the input/delivery stations in a margin area of the depot system and preferably structured in relation to their mechanisms for a vertical displacement, similar to the apparatuses for serving the shelves. Thus, the invention

can be used, depending on a particular depot position, for apparatuses for serving shelves and/or stationary transfer means and/or stationary lifting means for storing and delivering an article in and out of the depot system. The stationary displacement means, and the stationary lifting means each preferably include drives. An article is stored in or delivered out of the depot system by of the stationary displacement and/or stationary lifting means, preferably without the aid of a shelf serving apparatus, such that the shelf serving apparatus can be used simultaneously for a different assignment. Furthermore, the shelf serving apparatus can operate to retrieve an article at a different position in the depot position, while a different article is moved via the stationary displacement means and/or the stationary lifting means to an intended depot position. Thus, the shelf serving apparatus can operate for a different assignment.

[0017] A stored article may be moved with the aid of displacement means and/or lifting means to a position more quickly than by the shelf serving apparatus, exclusively. Moreover, the shelf serving apparatus can be used for a different task, thereby reducing the time required to access another article. In such case, a timesaving is realized, which further increases the throughput of articles and the availability of the articles in the depot.

[0018] Moreover, since the present invention includes a stationary means for rotating articles located in the depot system, articles are properly aligned before storing the article on a storage place or prior to the delivery of the article. This provides an improvement over prior art parking houses, in which the input and delivery stations are arranged are operated as input and delivery stations exclusively. Thus, the system is substantially simpler over prior art depot systems, resulting in significantly shortened delivery times.

[0019] In another example embodiment of the invention, the depot is equipped with at least two shelf serving apparatuses which include transfer means for a direct transferring of at least one article between each other. This embodiment allows a work dividing operation of the shelf serving apparatuses, so that some of the operating steps associated with storing and delivering articles may be partly executed at the same time by each respective shelf serving apparatus. Thus, a further saving of time is realized.

[0020] Continuing with this example embodiment, at least a first shelf serving apparatus preferably includes more receiving spaces for articles than the second shelf serving apparatus. This embodiment provides one shelf serving apparatus with a considerably smaller weight than the other one, thereby leading to differences of the masses of the shelf serving apparatuses which are accelerated and decelerated during operation. This results in a time saving during processing, storing and/or retrieving, because the lower weight shelf serving apparatus is preferably used for movement intensive duties, while the shelf serving apparatus having the higher weight is preferably used for intermediate storage functions with fewer moving operations.

[0021] The transfer means of the shelf serving apparatuses are preferably designed such that they can hand over between each other at least one article during a moving operation, and a transferring is possible while an article is moved to a destination position This results in a time saving during a processing of a commission.

[0022] In yet another aspect of the invention, the depot includes a plurality of spaces for articles and an automatic storage system with a shelf-like design and a transfer means to move articles between at least two locations, and is operated in such a manner that at least two of the transfer means execute storing and retrieving operations for one single article, thereby dividing the work between automatic

storage system and the transfer means at the same time. This also leads to a saving of time.

[0023] The transfer means is operated for storing and retrieving, respectively, of a single article and preferably comprises at least two shelf serving apparatuses or at least two stationary displacement means. Alternatively, the transfer means comprises at least one shelf serving apparatus and one stationary displacing means which co-operate in work dividing ways as described above. Further, preferred embodiments additionally or alternatively include at least one stationary lifting means for a vertical displacing of articles. Additionally, stationary means is operated to rotate articles.

[0024] In case articles are arranged in the shelves in several layers, a shelf serving apparatus may retrieve and again store articles located in front of a storage space, whereas an article to be moved is commissioned by a further shelf serving apparatus, which again increases the operating speed.

[0025] Furthermore, a first shelf serving apparatus stores or retrieves articles located in front of a storage base, while a second shelf serving apparatus retrieves an article to be moved from a input station or a transfer means, e.g. a stationary displacement means of the depot, or brings the article to a delivery station or a displacing means of the depot.

[0026] In a further preferred embodiment, the depot comprises stationary displacement means and is designed such that the transfer of an article between an input station, loading station or a delivery station of the proceeds directly and on the same vertical position as the transferring between a user and the input station, the loading station or the delivery station.

[0027] Depending upon a particular situation, it is preferred that the transfer of an article between a input station, a loading station or a delivery station occurs via

the stationary displacement means and proceeds directly transversely to the transferring direction between station and user. It is additionally foreseen that, in case of depots having several stations, the stations may include different displacement means for the system and the user, respectively. Moreover, the parking building may be designed such that the direction of the transfer between a station and the displacement means of the depot system is determined selectively depending on an optimal pass of operation.

[0028] In yet a further embodiment, the depot has a automatic storage system that includes at least one stationary means for rotating articles in the storage system, and a stationary means for a rotating of the articles around a vertical access is provided. This enables a desired storing and/or retrieving orientation, a shortening of the retrieving time and a decrease of space required at the delivering is arrived at.

BRIEF DESCRIPTION OF THE DRAWINGS

[0029] Further preferred embodiments of the invention follow from the following description with reference to the drawings. There is illustrated in:

[0030] Figure1 a side view of a shelf like designed parking house with two shelf serving devices;

[0031] Figure 2 a floor plan of the drive in and drive out floor of a parking house variant with input and delivery stations arranged at the same sides;

[0032] Figure 3 a floor plan of the floor above the drive in and drive out floor of Figure 2;

[0033] Figure 4 a floor plan of the drive in and drive out floor of a further parking house variant with input and delivery stations at opposite sides;

[0034] Figure 5 a section along the lines A-A of Figures 2 and 4;

[0035] Figure 6 a section along the line B-B of Figure 4;

[0036] Figure 7 a section along the line B-B of Figure 4; and

[0037] Figure 8 a floor plan of the drive in and drive out floor of a further variant of a parking house with loading stations, a stationary lifting means and a stationary means for a rotating.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0038] The design of an example embodiment of the invention includes a car park building is illustrated in Figure 1. The parking house includes a shelf-like design comprising a plurality of parking spaces with a plurality of rows X0-X7 and on several floors Y0-Y5. The parking house includes, furthermore, transfer means which include a plurality of displacement means 12 and two shelf serving apparatuses 1,2. The shelf serving apparatuses 1,2 are displaceable along the rows X0-X7.

[0039] Such as seen in Figures 2 and 3, each row includes a plurality of storage places a, b, c, d, e, f, g, h arranged behind each other and forms a horizontal displacement path of the shelf serving apparatuses a lane 13 between two rows of shelves having the same depth.

[0040] Such as illustrated in Figure 5, both shelf serving apparatuses 1,2 can individually be displaced in lane 13 and can include receiving places E, F, G, H for vehicles which are displaced vertically. As shown, the first of the shelf serving apparatuses 1 includes one receiving space E for one single vehicle, whereas the second shelf serving apparatus 2 provides three receiving places F, G, H. In this embodiment, the receiving spaces F, G, H of the shelf serving apparatus 2 are

displaced together. Of course, one skilled in the art will recognize that other embodiments are envisioned, for example, in which the receiving places are vertically displaced independent of each other.

[0041] Such as shown in Figure 2, driving in and driving out of the parking house proceeds from the same side. The narrow side of the parking house includes two input stations 3,4 and three delivery stations 5,6,7, whereas the input stations include rotating means 8 for rotating vehicles in the cells 9. Rotating means 8 may be rotating tables, an arrangement of rollers or other similar structure. As described above, it is foreseen to arrange stationary means for a rotating an article in the storage system itself. This embodiment, however, is less desirable because it results in a reduction of available storage places. This rotating means 8 may have a structure which is similar to the above-described embodiments.

[0042] As shown in Figures 6 and 7, each input station includes two cells which are vertically displaced as one unit between two positions, wherewith the two cells are located, alternatively once at the drive-in floor and the other time at the floor located above or below the drive-in floor. Both cells 9, preferably, are open at their front surfaces. If a cell 9 is located at the drive-in floor, its inner space is limited at its end against the parking house by a wall 10 of the house. The end surface at the drive-in side is open and allows a driving into the cell 9. If one cell 9 is located at the floor above or below the drive-in floor its inner space is limited at the drive-in side at the end surface by a wall 10 of the building. The end surface facing into the parking house preferably is open and allows the transferring of a vehicle to the depot system by either stationary displacement means 12. Furthermore, additional stationary displacement means 12 for displacing vehicles between rows X0-X7 of each floor and also within the storage spaces a, b, c, d and e, f, g, h, respectively, of each row of the floor are envisioned. Displacement means 12 can be formed, for instance, by a system of rollers or conveyer strips, of chain conveyers, a rail system

or similar structure. Although the above-described embodiments provide depots with exclusively separate input and delivery stations, other embodiments are foreseen in which stations operate as either input or delivery stations, thus forming multi-functional loading stations. This leads to the advantage that the depot can be adapted according to a required capacity for loading and discharging articles. Specifically, in case of parking houses with a cyclical peak load, for instance in parking houses of companies, a distinct time advantage is realized for the user is realized. Additionally, other embodiments are foreseen in which, during times of a reduced loading, a vertical displacement of cells 9 of the input station 3,4 are not used, and the vehicles are transferred exclusively by horizontal displacement in the longitudinal or transverse direction, between the cell located at the drive-in floor and a stationary displacement means 12 of the depot system on the same floor. In such a case, the wall 10 of the building located at the drive-in floor can be designed as an automatically operated rolling door.

[0043] The design of the parking house, as illustrated in Figure 4, differentiates from that illustrated in Figure 2 in that the inputting and delivering of vehicles takes place at opposite sides, and a rotating of vehicles does not occur. The input stations 3,4 are, accordingly, at other locations and include no means for a rotating of the vehicles. In this example embodiment, the features shown and described with respect to Figure 2 are provided.

[0044] The general operation when storing a vehicle in the parking house with reference to the embodiment shown Figure 2 is now described.

[0045] A vehicle to be stored is driven by into cell 9 of one of the two input stations 3,4 and located at the driving-in floor and parked. Depending on the design, the parking space may be formed by a transport system carrier, for example, a pallet, or also by a transport system having no support, such as e.g. transport rollers. If a

support is used, it is preferably delivered to cell 9 from a separate storage location. After the driver has left the vehicle and the cell 9 of a respective input station 3,4, the two cells 9 of the input station 3,4 located above each other are vertically displaced as a unit so that the cell 9, including the vehicle, is located at a floor above or under the drive-in floor, and a second, empty cell 9 is moved to the drive-in floor. During this displacing operation, the vehicle in the cell 9 is rotated by a built-in rotating apparatus 8, e.g., a rotating table, into the desired delivery position. After the displacing of the cells 9 and the vehicle is rotated, the vehicle is transferred, preferably by aid of stationary displacement means 12 to the storage system. In this embodiment, the transferring occurs in the direction of the drive-in in and parallel to the direction of displacement of the shelf serving apparatus 1,2. In the example embodiment in which supports, such as palettes, are used, cell 9 comprises an empty support.

[0046] Simultaneous with the transferring of the first vehicle to the depot system, a next vehicle is driven at the drive-in floor into a second cell 9 of the input station 3,4 and parked. After the first vehicle is transferred from the first cell 9 of the input station 3,4 to the storage system, and the loading procedure of the second cell 9 is complete, both cells 9 are displaced as a unit in a vertical direction in the initial position during which the next vehicle in the second cell 9 is rotated into a desired delivery position. After the cells 9 are displaced and, if desired, the vehicles are rotated, the now empty first cell 9 is ready for a renewed loading during which the transferring of the next vehicle from the second cell 9 to the storage system occurs. This procedure is repeated for storage of additional vehicles into the parking house.

[0047] The first vehicle which has been passed on to the depot system, is, depending on the storage place that is allocated for the same by process control and the most efficient way to the storage place is determined, forwarded with the aid of the stationary displacement means 12 and/or the shelf serving apparatuses 1,2 to this

predetermined storage place. If the predetermined storage place is at a floor different from the input floor, or if it is not reachable by a longitudinal and/or transversal displacing by means of the stationary displacement means, the vehicle is preferably shifted to a place adjacent the transfer lane 13 of the shelf serving apparatuses 1,2 where additional storing of the vehicle on the predetermined storing place proceeds through the shelf serving apparatus 1,2. To this end one of the shelf serving apparatuses 1,2, takes the vehicle to be stored from the place adjoining the transfer lane, and stores it provisionally on one of receiving places E, F, G, H. In case the predetermined storing place can not, for example, be reached by the shelf serving apparatus 1,2 with the vehicle to be stored, an operation dividing the work between both shelf serving apparatuses 1, 2 and the stationary displacement means 12 occurs. For example, it may be necessary to store a vehicle on a predetermined storing place in order to intermediately store a plurality of other vehicles that located in front thereof. The number of vehicles may exceed the capacity of the intermediate storing of the shelf serving apparatus 1,2 which has received the vehicle, thus the storing system of the illustrated parking house has additional stationary lifting means 14, and, depending on the rate of utilization of the shelf serving apparatuses 1,2 and the position of the predetermined storage place, the storing is made by aid of the stationary lifting means, with or without co-operation of a shelf serving apparatus 1,2.

[0048] The operation during the storing is now described with reference to a specific example.

[0049] A vehicle to be stored is driven into the input station 3 at cell 9 and parked. After the driver has left the vehicle, a vertical displacement of both cells 9 of the input station 3 occurs, so that the vehicle to be stored is placed in the floor above or under the drive-in floor (see Figure 3) for a transferring to the depot system. During vertical displacement of cells 9, the vehicle is simultaneously rotated by the

rotating device 8 by 180°, such that the vehicle can be driven out for delivery, easily. After the vehicle has been transferred from the cell 9 onto the depot system, the vehicle to be deposited is located at the place c1 from where, in case the predetermined storage base may not be reached by a longitudinal and transversal displacing (via stationary displacement means 12), it is displaced to place d1. In this example, it is assumed that the storage base for this vehicle, which has been determined by the depot system, is at the position h6 on a different floor and that, at the same time, the storage places e6, f6 and g6 on the other floor are occupied by other vehicles. Thus, it is not possible to reach this place from the transfer place c1 by a longitudinal and/or lateral path. For this reason, the vehicle is now made ready by a transverse displacing onto position d1 for a further depositing via the shelf serving apparatus 1,2. During the movement of the first shelf serving apparatus 1 to the position d1, in order to receive the vehicle at its receiving place E, the shelf serving apparatus 2 moves to the storage place e6 of the floor of the predetermined storing place and stores the vehicle there as an intermediate storing on the receiving place H.

[0050] Continuing with the above example, the three receiving places of the shelf serving apparatus 2 are displaced vertically so that the receiving place G is available to receive another vehicle which has been transferred by a transverse displacement from the storage place f6 to place e6. In the same manner, the vehicle which is stored on the storage place g6 is taken over to the receiving place F of the shelf serving apparatus 2 and stored there temporarily. During the time in which the shelf serving apparatus 2 makes the temporary intermediate storing of the vehicles located on the storage places e6, f6, g6, the shelf serving apparatus 1 with the vehicle to be stored has started to move towards the predetermined storage place and its storage place E has already being displaced vertically to the predetermined final floor. After all temporarily stored vehicles are located in the receiving places of the

shelf serving apparatus 2, the apparatus 2 moves horizontally in the shelf row X7. At the same time, the shelf serving apparatus 1, with the vehicle to be stored, moves in the shelf row X6 and transfers the vehicle to the storage place e6. The now free storage serving apparatus 1 moves towards a new destination position and, during this time, the shelf serving apparatus 2 occupies its old position in the row X6 and begins in the inverse sequence with re-storing of the vehicles located on the receiving places F, G and H onto the storage places e6, f6, g6. At the same time, the vehicle is stored by a transverse displacement by means of stationary displacing means from the place e6 to the storage place h6.

[0051] The general sequence when delivering a vehicle out of the parking house is now be described by way of another example.

[0052] The storage position of a vehicle to be delivered is determined by process control and the fastest path for delivery given a particular location is determined. If the vehicle to be delivered is located on a storage place where the desired delivery station 5,6,7 can be reached via longitudinal and/or transverse displacement on the floor, the positioning of the vehicle for transfer to the delivery station 5,6,7 proceeds directly by the stationary displacement means 12 and without the co-operation of the shelf serving apparatuses 1,2. If, however, the delivery station 5,6,7 can not be reached from the storage place of the vehicle via a longitudinal and/or transverse displacement, the delivering of the vehicle is made by aid of one or both shelf serving apparatuses 1,2. If the storage place is not directly adjacent to the transfer lane 13 of the shelf serving apparatuses 1,2, the vehicle is first made available by a temporary storing of vehicles located in front of the same and a displacement to a place adjoining the transfer lane 13 of the shelf serving apparatuses 1,2 for transfer to one of the shelf serving apparatuses 1,2 such that the delivery of the vehicles proceeds by the shelf serving apparatuses 1,2. Thus, one of the two shelf serving

apparatuses 1,2 takes the vehicle to be delivered from the place adjoining the transfer lane 13 and stores it temporarily on one of its receiving places E, F, G, H.

[0053] In case a predetermined place for a transfer to the predetermined delivery station 5,6,7 can not be reached by the shelf serving apparatus 1,2, , or if it is necessary to retrieve the vehicle from the storage place in order to temporarily store it at a intermediate storage, perhaps due to a plurality of vehicles which are stored in front of said storage place and which exceed in number the intermediate storing capacity of the shelf serving apparatuses 1,2 which receives the vehicle, a work dividing co-operation of both shelf serving apparatuses 1,2 and of the stationary displacement means 12 occurs during the delivering of the vehicle.

[0054] A description of the operation associated with vehicle delivery is now provided with reference to a specific example.

[0055] When a vehicle which has been previously stored on the storage place h6 is to be delivered, the shelf serving apparatus 2 moves, as described above with reference to the storing in row X6, and takes the vehicles stored on the storage places e6, f6 and g6 onto its receiving places H, G and F for an intermediate storing. At the same time, the vehicle to be delivered is displaced step by step by means of stationary displacement means 12 from the storage place h6 to the place e6. After the intermediate storing has been made, the shelf serving apparatus 2 moves in row X7 during which the shelf serving apparatus 1 moves into row X6, where ts receiving place E has already been brought vertically into position. The shelf serving apparatus 1 takes the vehicle to be delivered from the place e6 onto its receiving place E and begins to move in the direction of the delivery station 5,6,7, whereby the receiving place E with the vehicle to be delivered is displaced vertically into the delivery floor (see Figure 2). At the same time, the shelf serving apparatus 2 begins with the re-storing of the temporarily stored vehicles as described above.

[0056] After the shelf serving apparatus 1 has reached row X0, it transfers the vehicle to be delivered to the place e0, from where the delivery stations 5 and 6 can be reached by a transverse displacement by means of stationary displacing means to the positions h0 and f0. It is also possible to place the vehicle directly onto the receiving place E of the shelf serving apparatus 1 of the delivery station 7. After the vehicle has been placed for a delivery station 5,6,7, the vehicle to be delivered is transferred by a longitudinal displacement to the delivery station 5,6,7 where it is taken over by the driver and driven out of the delivery station 5,6,7.

[0057] If, for instance, a vehicle is to be delivered from the storage place g6 (which contains only two vehicles placed between this vehicle and the transfer lane of the shelf serving apparatuses), it is possible that the shelf serving apparatus 2 takes the vehicles in front of the vehicle to be delivered from the storage places e6, f6 and takes the vehicle to be delivered from the storage place g6 over onto its receiving places H, G, F, during which the shelf serving apparatus 1 positions itself aside of same. Thereafter, both shelf serving apparatuses 1,2 move in the direction to the delivery station 5,6,7. During this moving operation, the vehicle to be delivered is transferred from the receiving place F of the shelf serving apparatus 2 to the receiving place E of the shelf serving apparatus 1. After the transfer has been completed, both shelf serving apparatuses 1,2 separate from each other and the shelf serving apparatus 1 moves towards the destination delivery station and, at the same time, the shelf serving apparatus 2 moves back to its initial position and again stores the temporarily stored vehicles.

[0058] There are also operations in which the transfer of a vehicle between shelf serving apparatuses, which stand still, lead to a shortening of the time for carrying out a commission. Furthermore, access to the corner places h7, a7 is possible by this kind of operation, thereby providing excellent utilization of space.

[0059] In addition to the examples described above regarding storing and delivering vehicles, there are a multitude of other combinations which provide a time savings by simultaneous working of the storing commissions in the input stations 3,4. The work dividing operation of the two shelf serving apparatuses 1 and 2 among each other, and together with the stationary displacement means 12, and, when appropriate, together with stationary lifting means 14 and/or means for a rotating of articles, leads to an additional shortening of the input and delivery time. The respective optimal solution at a actual occupation and occupation constellation is determined by a process calculator of the depot system, which correspondingly controls the co-operating of the individual active components of the depot system.

[0060] Besides the control of all active components, depending on the prevailing occupation for as high as possible time-optimal execution of the storing and delivering commissions, respectively, the process calculator of the depot system is in a position (and in the absence of a direct storing or delivery), to make internal transfers or also, for example, to transfer vehicles which are to be delivered at a certain date and time, temporarily into storage places which are less accessible and to keep these vehicles there until time of delivery, when the vehicles can be stored in places which can be accessed quickly. Also group-wise preparations can be thought of so that, for example, all vehicles of one group are made ready on the storage places h1 to h7 and thus can be transferred directly when called upon by a longitudinal displacing by means of stationary displacing means 12 to the delivery station 5. This operation does not influence the normal inputting and delivering methods of the operation of the parking house during the delivering of this group of vehicles.

[0061] Figure 8 illustrates a plan view of the drive-in and delivery floor of a further variant of a parking house with three stationary loading stations 15, which can be operated as desired depending on the necessity of input or delivery stations.

In the illustrated case, the parking house is designed such that the transfer between a loading station 15 and displacement means 12 of the depot system is made by longitudinally displacing the vehicles, and, accordingly, occurs on the same vertical position (also in the drive-in and drive-out floor) such as also the transfer of the vehicle between the loading station 15 and the user. As can be seen, the illustrated parking house includes in its storing system a stationary lifting means 14 for vertical displacing vehicles between the floors of the parking house and stationary means 8, for rotating the vehicles around a vertical axis into the desired storing and delivery, respectively, orientation. The rest of the design of the illustrated parking house and the other kinds of operation are the same as at the embodiments described above.

[0062] Whereas preferred embodiments of the invention are described in the present application, the invention is a not restricted to these and may also be practiced otherwise within the scope of the following claims.